УНИВЕРЗИТЕТ У БЕОГРАДУ
ПОЉОПРИВРЕДНИ ФАКУЛТЕТ

УНИВЕРСИТЕТ В БЕЛГРАДЕ
АГРОНОМИЧЕСКИЙ ФАКУЛЬТЕТ

UNIVERSITY OF BELGRADE
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Dear Colleague Dr. Mohammad Mustafizur Rahman,

On behalf of the Organizing Committee of the 8th International Conference Water and Fish 2018 (W&F18) we are pleased to cordially invite you to participate in the Conference as an Invited speaker and Scientific Committee member and present a topic on behavioral aspects of common carp.

Our W&F18 Conference will take place in June (13-15) 2018 in Belgrade, Serbia, at the Faculty of Agriculture University of Belgrade. Water & Fish covers all aspects of aquaculture production (from production systems, feed, selective breeding to bio-safety, fish health and welfare) and fishery, water quality, aquatic biology, education, socio economic aspects etc (about previous W&F http://www.cefah.agrif.bg.ac.rs/conference/conference.html).

We would like to ask you to send the full text of your paper before May 10, 2018 by e-mail.

Knowing that your contribution to the Conference will be very valuable, thank you very much on the behalf of the Scientific and Organizing Committee of the Conference

With our best regards,

President of Scientific Committee

Prof. Dr Zoran Marković

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WATER & FISH

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with a support of
European Aquaculture Society, EAS and
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For the paper presented

Title: INTER AND INTRASPECIFIC INTERACTIONS UNDER EXPERIMENTAL CONDITIONS AFFECT BEHAVIOR AND FEEDING NICHE OF COMMON CARP

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President of the Scientific and Organizing Committee

Prof. Dr. Zoran Marković

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UNIVERSITY OF BELGRADE, FACULTY OF AGRICULTURE - SERBIA
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SUPPORTED BY
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(PASTI)

8th INTERNATIONAL CONFERENCE "WATER & FISH"

CONFERENCE PROCEEDINGS

Faculty of Agriculture, Belgrade-Zemun, Serbia
June, 13 – 15. 2018.

CIP - Каталогизација у публикацији
Народна библиотека Србије, Београд

639.2/.3(082)

INTERNATIONAL Conference "Water & Fish" (8 ; 2018 ; Beograd)
Conference Proceedings / 8th International Conference "Water & Fish", Faculty of Agriculture, Belgrade-Zemun, Serbia, June, 13-15. 2018. ; [editors in chief Vesna Poleksić, Božidar Rašković and Zoran Marković]. - Belgrade : University, Faculty of Agriculture, 2018 (Novi Sad : Graphic). - XII, 544 str. : ilustr. ; 23 cm

Tekst na engl. i srp. jeziku. - Na spor. nasl. str.: Zbornik predavanja. - Tiraž 400. - Bibliografija uz svaki rad. - Apstrakti ; Abstracts.

ISBN 978-86-7834-308-7

a) Рибарство - Зборници
COBISS.SR-ID 264387852

ISBN 978-86-7834-308-7

9 788678 343087

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INTER AND INTRASPECIFIC INTERACTIONS UNDER EXPERIMENTAL CONDITIONS AFFECT BEHAVIOR AND FEEDING NICHE OF COMMON CARP

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INTER I INTRASPECIFIČNE INTERAKCIJE UTIČU NA PONAŠANJE I HRANIDBENU NIŠU ŠARANA POD EKSPERIMENTALNIM USLOVIMA

Apstrakt

Među mnogobrojnim morskim i slatkovodnim ribama, šaran (*Cyprinus carpio*) je globalno privukao verovatno najviše pažnje. Veliki adaptivni kapacitet, zajedno sa brzim prirastom, rano sazrevanje i visok fekunditet je omogućio šaranu preživljavanje i naseljavanje velikog broja različitih tipova vodenih staništa, čineći ga rasprostranjenim širom sveta (Zhou et al. 2000; Piria et al. 2016). Šaran je jedna od najpopularnijih riba za ishranu u Centralnoj Aziji i Evropi gde se najčešće gaji ili u monokulturi ili polikulturi u ekstenzivnim ili poluintenzivnim sistemima (Adamek et al. 2012; Rahman 2015).

Interakcije vrsta zbog limitiranih resursa u prirodnim sredinama dovode do pojave različitih adaptacija u ponašanju i ishrani dovodeći do ublažavanja ovih efekata (Brannas 2008; Fox and Bellwood 2011). Međutim, istraživanje socijalnog ponašanja i ponašanja u ishrani šarana direktnim posmatranjem u prirodnim ekosistemima, posebno jezerima, akumulacijama i rekama je veoma ograničeno usled visokog turbiditeta i, kao posledice toga, slabe vidljivosti. Inter i intraspecifične interakcije u ishrani i ponašanju mogu da pruže uvid u ponašanje i hranidbene niše šarana i pratećih vrsta riba.

Da bi se razumele interakcije u ponašanju šarana i pratećih vrsta riba, dve studije su izvedene u simuliranim ribnjačkim objektima, u kojima su uspostavljeni polu prirodni uslovi. Da bi se razumeli efekti različitih izvora hrane na (i) hranidbenu nišu i selektivnost u ishrani, i (ii) dnevni ritam ponašanja šarana u hranjenju, plivanju, odmaranju i okupljanju u jata, tri tretmana su poređena (tretman samo sa zooplanktonom, tretman sa zooplanktonom i bentičnim makroinvertebratama i tretman sa zooplanktonom, bentičnim makroinvertebratama i veštačkim hranivom). Da bi se razumele inter i intraspecifične interakcije u ponašanju, ponašanje šarana je praćeno u prisustvu rohua (*Labeo rohita*), vrste

ribe koja se hrani u vodenom stubu. U ovom eksperimentu korišćene su dve gustine šarana, sa i bez dodatog veštačkog hraniva.

U tretmanima gde je korišćen zooplankton i bentične makroinvertebrate, šaran se uglavnom kretao u blizini dna sistema, hraneći se pre svega bentičnim makroinvertebratama. U odsustvu bentičnih makroinvertebrata došlo je do promene, i šaran je većinu vremena provodio u vodenom stubu, gde se najviše hranio zooplanktonom. Kada je veštačka hrana bila dostupna, šaran je odmah prelazio na tu vrstu hrane. Međutim, ponašanje i hranidbena niše šarana su bile pod uticajem intraspecifične kompeticije, ali ne i pod uticajem drugih vrsta riba, naročito rohua. Sa druge strane, ponašanje rohua je bilo pod velikim uticajem šarana.

Rezultati inter i intraspecifičnih interakcija u ponašanju bi se potencijalno mogli koristiti u daljem razvoju tehnika gajenja šarana.

Ključne reči: *Cyprinus carpio, Labeo rohita, hranidbena niša, ponašanje, ishrana, plivanje, kompeticija*

Abstract

Among various marine and freshwater fishes, common carp (*Cyprinus carpio*) has perhaps attracted the most attention from humans across the globe. The high adaptive capacity along with the fast growth, early maturity and high fecundity has enabled common carp to persist and proliferate in a wide array of environments, making them widespread throughout the world (Zhou et al. 2000; Piria et al. 2016). Common carp is one of the most popular food fish in Central Asia and Europe, where it is commonly cultured in either in monoculture or polyculture ponds applying extensive or semi-intensive methods (Adamek et al. 2012; Rahman 2015).

Species interaction for limited resources in the natural world leads to various behavioral and feeding adaptations in species to mitigate these effects (Brannas 2008; Fox and Bellwood 2011). However, study on social and feeding behaviours of common carp through direct observation in natural environments particularly in lakes, reservoirs and rivers have largely been restricted due to high turbidity and, in consequence, low visibility. Inter and intraspecific feeding and social interactions can provide more insight on behaviour and feeding niches of common carp and co-cultured fish.

To understand behavioural interactions of common carp and co-cultured fish, two separate studies were conducted in simulated ponds, in which semi-natural conditions were established. To understand the effects of various food resources on (i) feeding niche and food selectivity, and (ii) diel behavioral rhythmicity particularly grazing, swimming, resting and schooling behaviours of common carp, three treatments were compared (treatment with only plankton, treatment with plankton and benthic macroinvertebrates and treatment with plankton, benthic macroinvertebrates and artificial feed). To understand inter and intraspecific behavioral interactions, behaviors of common carp was directly observed in presence of water column feeder fish (rohu *Labeo rohita*). In this experiment, two densities of common carp were used, with and without supplying artificial feed.

In systems containing plankton and benthic macroinvertebrates, common carp mainly lived near the bottom of the system, feeding primarily on benthic macroinvertebrates. In the absence of benthic macroinvertebrates, they shifted from near the bottom to the water column where they spent majority of the time and fed principally on zooplankton.

When artificial feed is available, common carp readily switched to artificial feed. However, behavior and feeding niche of common carp were influenced by intraspecific competition, but not by the presence of other fish particularly rohu. The behavior of rohu was greatly influenced by the presence of common carp. The results of inter and intraspecific behavioral interactions could be potentially used to further the development of common carp husbandry techniques.

Keywords: *Cyprinus carpio; Labeo rohita; Feeding niche, Behaviour, Grazing, Swimming; Competition*

ACKNOWLEDGEMENTS

We gratefully acknowledge the European Commission for financial support through Pond–Live project. I also thank to Dr. Marc Verdegem, Aquaculture and Fisheries Group, Department of Animal Science, Wageningen University, The Netherlands, for his cooperation during conducting this experiment.

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